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Exploring the Link Between Eating Habits, Sleep Quality, and Toddler Growth Through Path Analysis

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Abstract
In 2023, it was recorded that 56.7% of children aged 0-59 months in Indonesia experienced growth that did not meet age standards. This study aims to explore the combined effects of eating habits and sleep quality on the growth of children aged 36-59 months. A total of 230 children from early childhood education (ECE) centres were analyzed using path analysis. The findings indicate that longer meal duration and picky eating habits directly influence children's growth, while emotional undereating, distractions during meals, and sleep quality have an indirect effect. The results emphasize the importance of healthy eating patterns and quality sleep for toddler development. Parents can positively contribute to their children's health by promoting balanced diets and consistent sleep routines. Parents and caregivers can establish regular mealtimes, reduce distractions during meals, and encourage consistent sleep schedules by understanding the impact of eating and sleeping habits.

Keywords: *eating behavior; growth; path analysis; preschool children*

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Introduction
The issue of malnutrition in Indonesia is commonly experienced by children aged 24-59 months (Kemenkes, 2024). According to data from the 2023 Indonesia Health Survey, 56.7% of children aged 0-59 months exhibited growth that did not meet the age-appropriate standards, with a stunting prevalence of 21.5%, wasting at 8.5%, underweight at 15.9%, and overweight at 4.2%. The prevalence of stunting decreased by 2.8% from the previous year, while overweight declined by 0.3%. However, the prevalence of wasting increased by 0.6%, and underweight rose by 0.1% (Kemenkes, 2023).

During this 'golden age,' children undergo intensive changes in functional systems (Tangse et al., 2021). Growth in children aged 3-5 years is a critical period that determines the quality of health and intelligence in the future. At this age, children's growth tends to slow compared to infancy but still continues, influencing motor, social, emotional, and cognitive development (Yusrawati et al., 2022). The importance of this growth period is also linked to the risks of stunting, underweight, and overweight, which may lead to health issues in adulthood (Cynthia et al., 2019).

Child growth and development during the first five years of life are closely related to their nutritional status (Paudel, 2024). Toddler growth is influenced by various interconnected factors, which can be categorized into several key areas: nutrition, eating habits, sleep quality,

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and environmental and psychosocial factors such as parenting styles, parental mental health, and socio-economic. Research consistently demonstrates that parenting styles play a pivotal role in shaping children's psychosocial outcomes. Authoritative parenting, characterized by high responsiveness and high demands, is associated with positive developmental outcomes, including better emotional regulation, social competence, and lower levels of behavioral problems (Awiszus et al., 2022; Khanum, 2023).

In contrast, authoritarian and permissive parenting styles often lead to adverse effects, such as increased aggression or social withdrawal in children (Khanum, 2023; ManyaPundir, 2020). Research has shown that permissive parenting is linked to higher screen time and sedentary behaviors, which can adversely affect children's physical health and development (Rabbani et al., 2022; Lloyd et al., 2014). Children raised in neglectful environments often experience emotional and behavioral problems, including low self-esteem and difficulties in forming healthy relationships (Wen, 2024). Studies have indicated that neglectful parenting is associated with academic underachievement and behavioral disorders, highlighting the critical role of parental involvement in fostering a supportive environment for growth (Wen, 2024).

The mental health of parents is another critical factor influencing child development. The quality of parent-child interactions, influenced by parental mental health, significantly affects children's emotional regulation and overall psychosocial adjustment (Haslam et al., 2020). Interventions targeting parental mental health have been shown to improve child outcomes, emphasizing the interconnectedness of parental well-being and child development (Woods et al., 2014; Britto et al., 2017).

The socio-economic status (SES) of families plays a crucial role in determining child growth and health outcomes. For instance, Kabdwal's analysis highlights that household economic status significantly influences malnutrition inequality among children, suggesting that improving economic conditions can lead to better nutritional outcomes and reduced child mortality (Kabdwal, 2024). Similarly, research by Srivastava and Kumar indicates that children from wealthier households exhibit lower rates of micronutrient deficiencies, reinforcing the idea that economic resources are vital for ensuring adequate nutrition (Srivastava & Kumar, 2021).

According to the Ministry of Health's Regulation No. 28 of 2019 on Nutritional Requirements (AKG), the energy needs of toddlers are differentiated into two age ranges: 1125 kcal/day for ages 1-3 years and 1600 kcal/day for ages 4-6 years. Adequate nutrition is crucial during the early years to support optimal growth and development (Mediani, 2020). A balanced and nutrient-rich diet is essential for supporting the growth of children's bones, muscles, and organs (Pathak et al., 2019).

Children who are picky eaters often lack the necessary nutrients for optimal growth. Picky eating, characterized by selective eating habits and rejection of various foods, can significantly impact a child's growth and development. Picky eaters tend to restrict their food choices, leading to inadequate intake of essential nutrients necessary for growth and development (Ali et al., 2022). This limited diet can result in malnutrition, affecting the child's overall health and growth status. Picky eating behavior may be linked to a tendency for emotional undereating, where children develop an unhealthy relationship with food based on emotions rather than nutritional needs (Kutbi, 2021).

Ali et al. (2022) reported that 50.4% of preschool children exhibited picky eating, highlighting its prevalence among children in their study population. Picky eating, characterized by selective eating habits and rejection of various types of food, can have a significant impact on a child's growth and development. Children who are picky eaters tend to limit their food choices, resulting in a lack of essential nutrients that are important for growth and development (Ali et al., 2022; Fitriana et al., 2020). Additionally, emotional undereating may result in insufficient calorie and nutrient intake for optimal physical development, potentially leading to stunted growth or underweight conditions (Essawy et al.,

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2020). Children experiencing emotional stress may show reduced appetite, resulting in inadequate nutrient intake and subsequent growth problems (Buja et al., 2022; Essawy et al., 2020). This behavior is influenced by a combination of emotional regulation, parental feeding practices, and psychological well-being (Trevino et al., 2021).

Mealtime distractions, such as the use of electronic devices, toys, noise, and other interruptions, have been linked to unhealthy eating patterns and a less positive emotional climate during meals (Saltzman et al., 2019). This lack of focus during meals may lead to unconscious eating or premature feelings of fullness, which can affect nutrient intake and a child's weight status. Additionally, mealtime distractions may interfere with parent-child interactions and engagement, affecting the quality of feeding practices and the development of healthy eating habits in children (Litterbach et al., 2023). Research shows that undistracted mealtimes are associated with better eating behaviors in preschool children, emphasizing the importance of a focused and interactive meal environment to encourage positive eating habits and healthy growth (Vik et al., 2021).

The duration of mealtime, whether too short or too long, can affect a child's nutrient intake. Research by Dallacker et al. (2023) suggests that longer family mealtimes may positively influence children's fruit and vegetable consumption. Longer mealtimes allow for a more relaxed and enjoyable eating experience, providing children with more opportunities to consume various nutritious foods. Moreover, mealtime duration affects the quality of parent-child interactions during meals, fostering communication and emotional bonding. Longer meal durations can also promote mindful eating, allowing children to recognize hunger and fullness cues, which contributes to healthy eating habits and optimal growth.

Murarkar et al. (2020) suggested that irregular mealtimes, such as insufficient meal frequency and inconsistent eating patterns, may contribute to malnutrition in children. In the context of metabolism, mealtime duration can influence the rate at which a child's body processes and utilizes nutrients. Fast metabolism, often associated with short meal durations and frequent snacking, may lead to higher energy expenditure and potentially affect weight regulation and growth. Conversely, slow metabolism, influenced by longer meal durations and irregular eating patterns, can affect nutrient absorption and utilization, potentially impacting overall growth and development.

Good and adequate sleep quality is vital for a child's growth, as the body releases growth hormones during sleep, which are crucial for physical development. WHO recommended that children aged 3-5 years need 10-13 hours of sleep daily. There is a variation in sleep fulfillment among children, with some meeting their sleep needs while others experience disrupted sleep. Lifestyle changes have led to reduced sleep duration among children. Research by Miller et al. (2019) showed that sleep duration and quality are related to eating behaviors in toddlers, indicating a link between sleep patterns and eating habits. Adequate sleep is essential for regulating hormones that control appetite and metabolism, which can affect a child's growth pathways.

Hoyniak et al. (2020) emphasized that clinical sleep problems, such as difficulty falling asleep or frequent nighttime awakenings, can affect children's socioemotional skills and cognitive abilities. Sleep disturbances may disrupt the body's natural processes, potentially leading to behavioral issues and cognitive challenges that can impact a child's growth.

Previous research by Nadira (2024), analyzed the effect of picky eating on malnutrition in children, Warkentin et al. (2023) studied the relationship between emotional undereating and the weight of 7-year-old children, Trinh et al. (2023) examined the influence of eating distractions on obesity, Salleh et al. (2023) investigated the impact of meal duration on underweight children, and the study by De Oliveira et al. (2024) analyzed the effect of frequent night waking on children's BMI. This previous research has tended to separate the analysis of eating habits and sleep quality to child growth, while the interaction between the two has been seldom studied. This study fills that gap by simultaneously exploring how factors such as picky eating, emotional undereating, mealtime distractions, meal duration, and sleep quality

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are interconnected and influence the growth of children aged 36-59 months. This approach offers a more holistic understanding of the factors influencing child development, which previous studies have not examined extensively.

Methodology

This cross-sectional study was conducted from August to September 2024 in Wonogiri Regency. The population of this study consists of children aged 36-59 months enrolled in the ECE center in Wonogiri Regency. The sample was determined using purposive sampling to deliberately select participants who met specific criteria relevant to the research objectives. The inclusion criteria required participants to be aged 36-59 months, actively attending ECE center, and willing to participate in the study, allowing researchers to target individuals most likely to provide meaningful data. Exclusion criteria, such as congenital abnormalities, recent infectious diseases, and the absence of a child health record book (KIA), were applied to minimize confounding variables that could affect the results. A total of 230 subjects met the study criteria.

The dependent variable in this study is growth, measured by the weight-for-age (WFA) z-score and the independent variables are picky eating, emotional undereating, mealtime distractions, meal duration, and sleep quality. Picky eating and emotional undereating were measured using a modified version of the Children's Eating Behavior Questionnaire (CEBQ) because it is a validated tool specifically designed to assess different dimensions of children's eating behaviors. Meal duration was assessed using an open-ended question in minutes. Mealtime distractions were measured using a modified version of the Children's Eating Behavior Inventory (CEBI) as it effectively gauges behaviors that may interfere with eating, and sleep quality was measured using a modified Children's Sleep Habit Questionnaire (CSHQ) as it provides a comprehensive evaluation of children's sleep patterns and habits, making it ideal for capturing variations in sleep quality. Growth was measured using a digital scale with a precision of 0.1 kg and converted into z-scores using the WHO Anthro 3.2.2 software. These tools were selected for their relevance and validity in measuring the specific variables central to the study's objectives.

The data processing begins with collecting raw data from surveys and field measurements. The data is then cleaned by checking and correcting errors such as missing or inconsistent information. Afterward, the data is coded or converted into a suitable format for analysis. Univariate analysis was conducted using descriptive statistics, bivariate analysis with simple linear regression, and multivariate analysis with path analysis.

Path analysis is a statistical technique used to examine the direct and indirect relationships between variables within a proposed model. It allows researchers to assess how different factors, or independent variables, influence a dependent variable, either directly or through other mediating variables. The process involves developing a theoretical model based on existing knowledge, estimating the strength of relationships between variables using regression analysis, and then evaluating the model's fit to the data. Path analysis is useful for testing complex hypotheses, as it can show how multiple variables interact with each other and how these interactions contribute to the outcome of interest.

Figure 1. Stages of path analysis method

DOI: 10.31004/obsesi.v8i5.2024

This study has received ethical approval as evidenced by the Ethical Clearance issued by the Health Research Ethics Committee of Dr. Moewardi General Hospital, Surakarta, with the number 1963/VIII/HREC/2024.

Results and Discussions

The univariate analysis explains the general description of each research variable, including picky eating, emotional undereating, mealtime distractions, meal duration, sleep quality, and WFA z-score.

Table 1. Univariate analysis results for picky eating, emotional undereating, mealtime distractions, meal duration, sleep quality, and WFA z-scores in children aged 36-59 months

Research variable	N	*Mean*	SD	Min	Maks
Picky eating	230	4.86	2.25	0	10
Emotional undereating	230	5.00	1.99	1	10
Mealtime distraction	230	4.98	2.14	0	9
Mealtime duration	230	28.86	13.89	10	60
Sleep quality	230	4.33	2.25	0	10
WFA *z-score*	230	-0.50	1.35	-3.23	5.31

Table 1 shows the results of the univariate analysis conducted on 230 research subjects. The picky eating variable had a mean score of 4.86, SD = 2.25, with a minimum score of 0 and a maximum score of 10. The emotional undereating variable had a mean score of 5.00, SD = 1.99, with a minimum score of 1 and a maximum score of 10. The mealtime distraction variable had a mean score of 4.98, SD = 2.14, with a minimum score of 0 and a maximum score of 9. The meal duration variable had a mean of 28.86 minutes, SD = 13.89, with a minimum duration of 10 minutes and a maximum of 60 minutes. The sleep quality variable had a mean score of 4.33, SD = 2.25, with a minimum score of 0 and a maximum score of 10. The WFA z-score variable had a mean of -0.50, SD = 1.35, with a minimum score of -3.23 and a maximum of 5.31.

Next, bivariate analysis was performed to determine the influence of picky eating, emotional undereating, mealtime distractions, mealtime duration, and sleep quality on the WFA z-score using simple linear regression analysis.

Table 2. Bivariate analysis results for the effects of picky eating, emotional undereating, mealtime distractions, meal duration, and sleep quality on the WFA z-score in children aged 36-59 months

Independent Variable	b	CI 95%		p
		Lower Limit	Upper Limit	
Picky eating	-0.30	-0.37	-0.24	< 0.001
Emotional undereating	-0.21	-0.30	-0.13	< 0.001
Mealtime distraction	-0.25	-0.32	-0.17	< 0.001
Mealtime duration	-0.06	-0.07	-0.05	< 0.001
Sleep quality	-0.21	-0.28	-0.14	< 0.001

Table 2 shows a negative effect of picky eating on the WFA z-score; this relationship is statistically significant. For each one-unit increase in picky eating, there is a corresponding decrease in the WFA z-score of 0.30 units. With a confidence level of 95%, each one-unit increase in picky eating will be followed by a reduction in the WFA z-score ranging from 0.24 to 0.37.

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The emotional undereating variable negatively affects the WFA z-score, and this relationship is statistically significant. A decrease follows each one-unit increase in emotional undereating in the WFA z-score of 0.21 units. With a confidence level of 95%, each one-unit increase in emotional undereating will be followed by a reduction in the WFA z-score ranging from 0.13 to 0.30.

The mealtime distraction variable has a negative effect on the WFA z-score, and this relationship is statistically significant. A decrease follows each one-unit increase in mealtime distraction in the WFA z-score of 0.25 units. With a confidence level of 95%, each one-unit increase in mealtime distraction will be followed by a reduction in the WFA z-score ranging from 0.17 to 0.32.

The meal duration variable negatively affects the WFA z-score, and this relationship is statistically significant. Each one-unit increase in meal duration corresponds to a decrease in the WFA z-score of 0.06 units. With a confidence level of 95%, each one-unit increase in meal duration will be followed by a reduction in the WFA z-score ranging from 0.05 to 0.07.

The sleep quality variable negatively affects the WFA z-score, and this relationship is statistically significant. Each one-unit increase in sleep quality corresponds to a decrease in the WFA z-score of -0.209 units. With a confidence level of 95%, each one-unit increase in sleep quality will be followed by a reduction in the WFA z-score ranging from 0.14 to 0.28.

The multivariate analysis used in this study is a path analysis model to analyze the direct and indirect relationships among the research variables using the STATA 13 application. The first stage of path analysis involves model specification to describe the influence of the variables under investigation by existing theories.

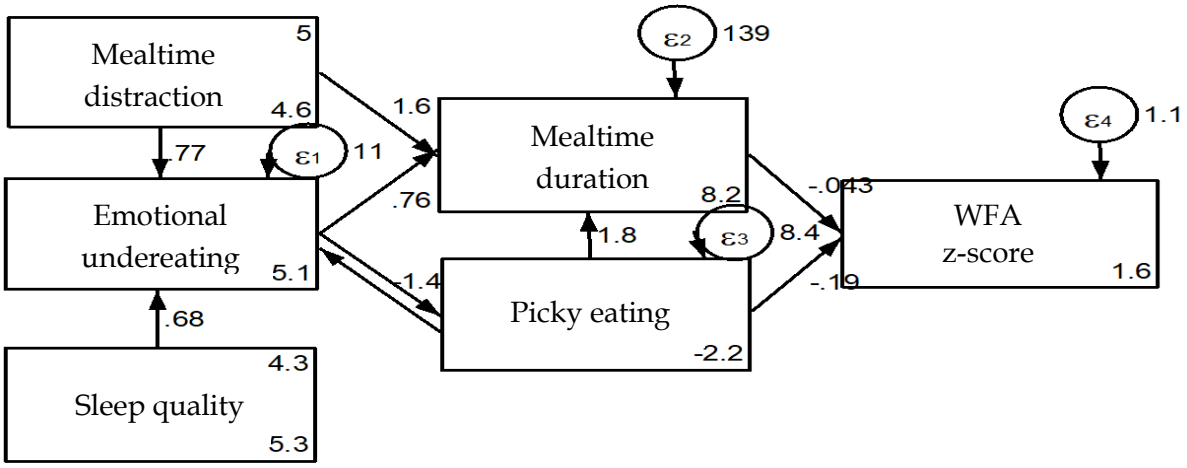

Figure 2. Estimation of the path analysis parameters for the effects of picky eating, emotional undereating, eating distractions, meal duration, and sleep quality on the WFA z-score

The second stage involves model identification by calculating the degree of freedom (df), which indicates whether path analysis can be conducted or not, using the following calculation formula: 1) the number of measured variables is 6; 2) the endogenous variables consist of 4 variables (picky eating, emotional undereating, meal duration, WFA z-score); 3) the exogenous variables consist of 2 variables (mealtime distraction and sleep quality); 4) there are 4 latent/error variables; the number of paths used is 9; 5) the parameters = number of paths + number of errors + number of exogenous variables = 9 + 4 + 2 = 15 parameters.

$$df=(\text{number of measured variables}\times(\text{number of measured variables}+1)/2)-\text{parameters}$$
$$Df= (6 \times (6+1) / 2) - 15 = 21-15 = 6$$

Path analysis can be conducted if df ≥ 0. If df = 0, then the path analysis model is just identified, indicating that path analysis can be conducted. If df > 0, then the path analysis

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model is over-identified, which indicates that path analysis can be conducted. If df < 0, then the path analysis model is under-identified, indicating that path analysis cannot be conducted. In the identification of this research model, a df value of 1 was obtained, which means the path analysis model is over-identified, allowing hypothesis testing about the relationships among the variables.

The third stage involves parameter estimation to show the existence of causal relationships. This relationship is indicated by the path coefficients (b). The path coefficients show the relationships between endogenous variables and exogenous variables in the original measurement units, which will be detailed in the table.

Table 3. Results of parameter estimation for path analysis of eating habits and sleep quality factors on the growth of children aged 36-59 months

Dependent Variable	Independent Variable	b	CI 95%		p
			Lower	Upper	
Direct effect					
WFA z-score	← Mealtime duration	-0.44	-0.54	-0.34	< 0.001
	← Picky eater	-0.31	-0.42	-0.20	< 0.001
Indirect effect					
Emotional undereating	← Picky eater	-1.60	-2.43	-0.77	< 0.001
	← Mealtime distraction	0.82	0.49	1.16	< 0.001
	← Sleep quality	0.78	0.38	1.18	< 0.001
Mealtime duration	← Emotional undereating	0.11	-0.02	0.23	0.088
	← Picky eater	0.29	0.17	0.42	< 0.001
	← Mealtime distraction	0.25	0.12	0.38	< 0.001
Picky eater	← Emotional undereating	1.24	0.90	1.58	< 0.001
N observasi	230				
Likelihood ratio	10.79				
Chi^2	0.055				

Table 3 shows a direct and negative influence of meal duration on WFA z-score, which is statistically significant. Children with longer meal durations are likely to experience a decrease in WFA z-score by 0.44 units compared to children with shorter meal durations. There is a direct and negative influence of picky eating on WFA z-score, which is statistically significant. Picky eaters are likely to experience a decrease in WFA z-score by 0.31 units compared to children who are not picky eaters.

There is an indirect and negative influence of picky eating on WFA z-score through emotional undereating, which is statistically significant. Picky eaters are likely to experience a decrease in emotional undereating by 1.60 units compared to children who are not picky eaters. There is an indirect and positive influence of mealtime distraction on WFA z-score through emotional undereating, which is statistically significant. Children exposed to distractions during meals are likely to experience an increase in emotional undereating by 0.82 units compared to children who are not exposed to mealtime distractions.

There is an indirect and positive influence of sleep quality on WFA z-score through emotional undereating, which is statistically significant. Children with poor sleep quality are likely to experience an increase in emotional undereating by 0.78 units compared to children with good sleep quality. There is an indirect and positive influence of emotional undereating on WFA z-score through meal duration, which is statistically insignificant. Children with emotional undereating are likely to experience an increase in meal duration by 0.11 units compared to children who do not experience emotional undereating.

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There is an indirect and positive influence of picky eating on WFA z-score through meal duration, which is statistically significant. Picky eaters are likely to experience an increase in meal duration by 0.29 units compared to children who are not picky eaters. There is an indirect and positive influence of mealtime distraction on WFA z-score through meal duration, which is statistically significant. Children exposed to distractions during meals are likely to experience an increase in meal duration by 0.25 units compared to children who are not picky eaters. There is an indirect and positive influence of emotional undereating on WFA z-score through picky eating, which is statistically significant. Children with emotional undereating are likely to experience an increase in picky eating by 1.24 units compared to children who do not experience emotional undereating.

The fourth stage involves model fit testing. The path analysis model developed by the researcher based on theory has undergone testing and fit tests with the best variable relationship model based on data from the samples collected by the researcher. The results of the model fit test in this study showed a chi-square value of 0.06 (> 0.05), RMSEA = 0.07 (≤ 0.08), CFI = 0.98 (≥ 0.90), TLI = 0.95 (≥ 0.90), and SRMR = 0.03 (≤ 0.08). Based on the model fit indicators and the results of the model fit test, it can be concluded that the path analysis equation model used is acceptable.

The fifth stage involves model re-specification, which can be conducted if the model fit test does not meet the criteria. Since the results of the model fit test in this study have met the criteria, no model re-specification stage was conducted. The results of the study indicate a direct and negative influence of meal duration on WFA z-score. This finding contradicts previous research by Tan et al. (2022), which suggested that slow meal duration significantly impacts obesity. However, the results of this study align with findings by Salleh et al. (2023), which indicated that underweight children require longer meal durations throughout the day. Tan et al. (2022) presented that children who eat at a slower pace tend to consume more than one serving and are more likely to increase carbohydrate intake compared to other nutritional sources.

Another study by Dallacker et al. (2023) investigated the effects of extended family meal duration on children's fruit and vegetable intake. This study compared regular family meal durations with interventions that extended meal duration by 50%, showing potential benefits in increasing children's consumption of fruits and vegetables. Meal duration can affect various metabolic processes in children, including the secretion and utilization of metabolic hormones such as leptin, ghrelin, insulin, cortisol, and growth hormone (Carabuena et al., 2022). Eating slowly can enhance gastric distension, which is a crucial factor in signaling satiety. As the stomach fills gradually, it sends signals to the brain indicating fullness, which can help prevent overeating (Saito et al., 2020; Yoshioka et al., 2021).

When meals take longer, the initial strong hunger may diminish over time, even if the food portion is not finished. This is because the hunger felt initially is often caused by low blood sugar or urgent energy needs. However, over time, the body begins to feel more satisfied as some energy needs are met, even if the child has not finished their entire meal (Caldwell et al., 2022). Eating slowly can enhance satiety through the mechanisms of gastric distension and metabolic hormone secretion, which help prevent overeating. However, excessively long meal durations may also lead children to feel full before finishing their meals, potentially resulting in inadequate nutrient intake.

Table 3 indicates a direct and negative influence of picky eating on WFA z-score. This finding is consistent with studies by Cahyaningrum et al. (2024) and Nadira (2024), which suggest that children with picky eating habits are more likely to experience malnutrition. Children exhibiting picky eating tendencies often demonstrate strong food preferences and reject certain foods or textures, which can further contribute to nutritional deficiencies (Cahyaningrum et al., 2024). These behaviors can lead to a limited dietary variety, inadequate nutrient intake, and potential health implications (Chao et al., 2021). Children with higher

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levels of picky eating may have lower z-BMI scores and consume fewer vegetables, indicating potential nutritional deficiencies (Sandvik et al., 2019).

Picky eating behavior has been linked to poorer developmental outcomes, lower physical activity, and lower zinc levels in children. Research indicates that failing to address picky eating can increase the risk of malnutrition and stunting, negatively affecting children's overall growth and development (Muflih et al., 2020). Children with picky eating tendencies are likely to consume fewer vegetables and other nutritious foods, which can impact their physical growth and development. This condition is also associated with lower WFA z-scores, low levels of physical activity, and an increased risk of deficiencies in essential nutrients like zinc, which can heighten the risk of malnutrition and stunting.

The results presented in Table 3 indicate an indirect negative effect of picky eating on WFA z-score through emotional undereating. This finding aligns with the research by Nadira (2024), which states that children with picky eating habits are more likely to experience malnutrition. When children refuse certain foods, they may experience frustration or anxiety, which can trigger emotional responses. For instance, when a child is forced to eat foods they dislike or are unfamiliar with, they may resort to emotional undereating as a coping mechanism, seeking comfort in foods or snacks they prefer and find more palatable (Akçay, 2023; Sandvik et al., 2019). This pattern can create a cycle where children become increasingly selective in their food choices, leading to a reliance on familiar foods that may not provide adequate nutrition, thereby exacerbating emotional stress and triggering more episodes of emotional undereating (Sandvik et al., 2019; Fitriana et al., 2020).

Research indicates that picky eaters often exhibit lower levels of positive emotions related to food, such as enjoying and looking forward to mealtime, which can further reinforce their selective eating habits (Shaker dan AL-Mosawi, 2022). This lack of positive engagement with food can lead to a cycle of emotional undereating, where the child seeks comfort in familiar foods, reinforcing picky eating tendencies and limiting their exposure to diverse eating patterns (Chao, 2018). Picky eating and emotional undereating in children can mutually influence each other, creating a cycle that is difficult to break. Children who experience anxiety or frustration when forced to eat disliked foods are likely to seek comfort in familiar foods, which often do not provide sufficient nutrition.

Table 3 also shows an indirect positive influence of eating distractions on WFA z-score through emotional undereating. This finding contradicts research by Trinh et al. (2023), which suggests that children exposed to distractions while eating are at risk of obesity. Other studies support this notion, indicating that such distractions can present challenges during meals, including limited food repertoire, sensory challenges, and food rejection behaviors, which can result in nutritional deficits and limited diets (Gonynor et al., 2022). Eating distractions, such as the use of electronic devices or other interruptions, have been linked to unhealthy food consumption and less positive emotional climates during mealtimes (Saltzman et al., 2019).

Research by Rahmad et al. (2020) highlights that malnutrition, including underweight issues, is common among toddlers in urban areas, where factors like family characteristics and socioeconomic status play crucial roles in nutritional outcomes. In environments where distractions are prevalent, toddlers may struggle to focus on their meals, leading to patterns of emotional undereating that disrupt their ability to consume adequate nutrition, increasing the risk of long-term underweight due to insufficient caloric intake. This can distract them from paying attention to the food they consume, reduce awareness of satiety, and potentially increase the intake of unhealthy foods. Additionally, distractions during mealtime can create a less emotionally conducive atmosphere, hindering positive family interactions.

Table 3 indicates an indirect positive influence of sleep quality on WFA z-score through emotional undereating. This finding contradicts Miller et al. (2019) and de Oliviera et al. (2024), who reported that children with shorter sleep durations and poor nighttime sleep quality tend to gain weight. Other research states that poor sleep quality and sleep disturbances can hinder optimal child development, affecting both physical growth and cognitive development

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(Alwanda et al., 2023; Bacaro et al., 2019). Studies have found that toddlers with poor sleep quality exhibit higher levels of emotional undereating, characterized by eating in response to emotional stress rather than hunger signals. This phenomenon is supported by findings that suggest a lack of sleep can lead to emotional dysregulation, increasing the likelihood of emotional eating behaviors in both adults and children (Miller et al., 2019).

Specifically, poor sleep quality has been linked to increased emotional undereating behaviors, indicating that sleep disturbances may exacerbate the tendency to eat in response to emotions rather than physiological hunger (Konttinen et al., 2019). Insufficient sleep can lead to emotional dysregulation that worsens children's tendencies to engage in emotional undereating, potentially impacting their overall health.

The findings in Table 3 indicate an indirect positive effect of emotional undereating on WFA z-score through meal duration. This aligns with Buja et al. (2022), which states that children exhibiting emotional undereating are 2.22 times more likely to experience underweight. Children engaged in emotional undereating may fail to consume enough calories to meet their growth and developmental needs. Studies have shown that less emotional eating is associated with lower body mass index (BMI), especially in children experiencing negative emotions (İnan, 2023).

This behavior can result in longer meal durations, as children may consume food to cope with negative emotions like stress, anxiety, or sadness, causing them to eat longer as their focus shifts from hunger to self-soothing (Ekim dan Ocakçi, 2020). Research indicates that children as young as three years can display emotional eating behaviors, suggesting that this is a learned response rather than an innate one (Manzano et al., 2021). Eating slowly can increase gastric distension, which is a crucial factor in signaling satiety. As the stomach fills gradually, it sends signals to the brain indicating fullness, which can help prevent overeating (Yoshioka et al., 2021; Saito et al., 2020). Emotional undereating significantly impacts meal duration in children through the complex interactions between emotional regulation, parental influence, and the emotional context during mealtime. Children involved in emotional eating tend to have longer meal durations, which can lead to unhealthy eating patterns and increase the risk of malnutrition or obesity.

Table 3 also shows an indirect positive influence of picky eating on WFA z-score through meal duration. This is consistent with research by Cahyaningrum et al. (2024), which indicates that children with picky eating habits are more prone to malnutrition. This behavior can lead to prolonged meal times, as children may require more time to eat due to their selective nature, often engaging in negotiations during meals or even refusing to eat altogether. Research suggests that picky eaters may spend more time at the dining table without consuming sufficient amounts of food, resulting in inadequate caloric intake (Qazaryan, 2019).

Furthermore, the extended meal duration associated with picky eating can create a negative cycle. When children take longer to eat and consume less, parents may feel pressured to intervene, leading to stress and conflict during mealtimes. This dynamic can further encourage children to refuse to eat, as they may associate mealtime with anxiety rather than nutrition (Chen, 2024). Additionally, the emotional aspects of picky eating, such as food neophobia (fear of new foods), can contribute to the child's reluctance to eat, resulting in longer meal durations and subsequent weight issues (Sandvik et al., 2019). Picky eating behaviors can lead to extended meal times, where children may spend more time at the table without consuming enough food, leading to inadequate caloric intake and creating a negative cycle where parental pressure to intervene contributes to stress and conflict during meals.

Table 3 indicates an indirect positive effect of eating distractions on WFA z-score through meal duration. This finding aligns with research by Ju et al. (2022), which shows that children exposed to distractions during meals experience slower meal durations. A key finding in the literature is that distractions can lead to increased meal durations. For example, children allowed to use gadgets while eating may take longer to finish their meals due to

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divided attention between food and distractions (Anjani, 2023; Marra et al., 2020). When children are not focused on their meals, they may miss sensory aspects of eating, such as taste and texture, which are vital for developing healthy eating habits (Vik et al., 2021).

Consequently, this pattern can contribute to nutritional imbalances and underweight conditions if children do not consume sufficient nutrition during their distracted meal sessions (Anjani, 2023). Distractions during mealtime, such as gadgets and toys, can significantly extend meal durations while disrupting children's ability to regulate their food intake. This can lead to overeating or undereating, affecting their overall nutritional status and potentially contributing to underweight conditions.

Table 3 also suggests an indirect positive effect of emotional undereating on WFA z-score through picky eating. This aligns with research by Warkentin et al. (2023), which indicates that children with emotional undereating are likely to experience weight loss. When children experience negative emotions during meals, they may turn to familiar and comforting foods, which are often less nutritious, to soothe themselves. This reliance on specific foods can lead to increased picky eating behaviors, where the child becomes selective about what they want to eat, often rejecting healthier options in favor of familiar and comforting foods (Kai et al., 2022).

This aversion can manifest as picky eating, where the child becomes reluctant to try new foods or even consume familiar foods, fearing that new foods might trigger negative emotions or discomfort (Muflih, 2020). Consequently, children may limit their diets to only a few types of food, leading to nutritional deficiencies and emotional issues related to food intake (Fitriana et al., 2020). Children experiencing negative emotions at mealtimes tend to select comforting and familiar foods, which are often lacking in nutrition.

Conclusions

The growth of children aged 36-59 months is influenced by prolonged meal duration and picky eating, and indirectly affected by emotional undereating, eating distractions, and sleep quality. This study highlights the need to promote healthy eating habits and improve sleep quality for optimal development. Parents can create structured mealtimes, minimize distractions, and encourage consistent sleep routines. Health practitioners can use these findings to design interventions addressing both nutrition and sleep. However, this study does not fully explore other factors influencing growth, such as genetics, parenting styles, parental mental health, and socio-economic conditions.

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